PAN-PACIFIC ENTOMOLOGIST
65(2), 1989, pp. 123–131

Eight New Species of Trichoptera

D. G. DENNING[1]

2016 Donald Drive, Moraga, California 94556.

Collections in Western United States have yielded a number of undescribed Trichoptera. Eight new species of *Rhyacophila, Dolophilodes, Wormaldia, Ochrotrichia,* and *Farula* are described. Unless indicated otherwise, types will be deposited in the California Academy of Sciences.

Rhyacophia balosa, NEW SPECIES

This species is a member of the *viquaea* Milne group. It is nearest to *lineata* Denning. Diagnostic differences are: contours of segment 9, tergum 10, apical and distal segments of the clasper and the phallus.

Male.—Length 9–10 mm. Wings, body, appendages ochraceous. Segment 7 mesal structure minute. Stigma of wings distinct. Genitalia (Fig. 1): Segment 9 apical margin arcuate, dorsum rotundate and curved ventrad to tergum 10, setation sparse. Tergum 10 consists of three distinct entities (Fig. 1): dorsal process (2) projected caudad, short, apex trianguloid; median process (b) attenuated, apex subacute, basal area brown pigmented, distal area opaque; ventral process (c) bifurcated lobes heavily sclerotized; from dorsal aspect ventral lobes curved mesad [Fig. 1b (c)]. Clasper basal segment quadrate; distal segment short, apex rounded; from ventral aspect entire inner surface with dense brown spicules which enhance its clasping function. Phallus dorsal portion is translucent membrane (t) attached to mesal surface of claspers (Fig. 1c); aedeagal base wide, attenuated to a narrow tubular structure (aed); viewed dorsally it is long and slender.

Female.—Length 11 mm. General color and structure similar to male. Segment 6 with an acute heavily sclerotized mesal process. First pair of apodemes extended from segment 6 to segment 9; second pair from segment 4 to 9. Bursa copulatrix (Fig. 1d) occupies segment 7 and part of segment 6.

Types.—Holotype male: California. Trinity County, Ditch Gulch, 7 mi W of Wildwood, Hwy. 36, 2 July 1977, Paul A. Peterson. *Allotype:* Trinity County, Cold Creek, 4 mi W of Wildwood, Hwy. 36, 2 July 1977, Paul A. Peterson. *Paratypes:* 1 male same data as allotype; 1 male Trinity County, Swift Creek, 2.5 mi W of Forest Glen, Hwy. 36, 1 July 1977, Paul A. Peterson.

Rhyacophila reyesi, NEW SPECIES

In the nearctic region this species is related to *karila* Denning. The arcuate shaped tergum 10, the contour of the distal segment of the claspers and the structure of the phallus differentiates *reyesi* from *karila.* This new species is known from the central coast area of California while *karila* Denning is known from the northern portion.

[1] Deceased.

Male.—Majority 8 mm. Sternum 6, 7 with acute mesal process. Wings, head, appendages uniformly ochraceous, spurs prominent 3-4-4, basal segment maxillary palpi with tuft of setae, frons with dense, long, yellowish setae. Genitalia (Fig. 2): Tergum 9 greatly enlarged, distal margin extended caudad as a slender ventral curved projection reaching beyond basal segment of clasper; from dorsal view medial crest very narrow. Tergum 10 [Fig. 2 (10t)] leaf-like plates widely divergent, caudal margin convex, apico-ventral corner acute; from caudal view (Fig. 2a) ventral margin emarginate, mesal surface with dense spicules. Clasper basal segment wide, short, almost twice as long as apical segment which is narrowed distally to an obtuse apex, blackish pigmented along margin. Phallus complex (Fig. 2b, lateral view), apex of dorsal process enlarged to a pair of arcuate lateral plates directed ventral (p); dorsal arm of carinate structure slender, subacute, directed caudad; paired ventral structures extend slightly beyond carinate structure, apex with pair of acute spines.

Types.—Holotype male: California. Marin County, Point Reyes National Seashore, Bear Valley Creek, 25 May 1975, D. G. Denning. *Allotype:* Same, except 26 June 1975. *Paratypes:* 7 males, 1 female, same data as allotype.

A comparison of the complex phallus of *karila* to *reyesi* is presented in Figure 3. There is very little similarity in the phallus between the two species.

***Rhyacophila chordata,* New Species**

The species is a member of the *rotunda* group which consists of the following five species: *rotunda* Banks, 1924; *norcuta* Ross, 1938; *ebria* Denning, 1949; *latitergum* Davis, 1950; and *tralala* Schmid, 1970. The diagnostic characters of the *rotunda* group are well illustrated by Schmid, 1970. Diagnostic characters are present in tergum 10 and associated preanal appendages, claspers, and the aedeagal complex.

Male.—Length 9.5–12 mm. General color light to dark brown. Male genitalia (Fig. 4): Typical of the group the dorsum of segment 9 is enlarged and sternum reduced. Coalescence of tergum 10 and preanals (pr) result in an apparent single structure; dorsal margin arcuate; viewed dorsally (Fig. 4a) emargination shallow or absent. Preanal appendages project ventro-caudad tubular, apex compressed with deep bifurcation, bearing the slightly variable heart-shaped anal sclerites (sa) [Fig. 4 (pr) and Fig. 4b (sa)], dark pigmented, structure capable of dorso-ventral movement. Phallus complex consists of a dorsal tubular process, apex giving rise to an acuminate structure bearing the apparent aedeagus (aed) which is projected dorsal and in repose is placed between apical lobes of preanal appendages (Fig. 4c); semi-membraneous parameres [Fig. 4c (par)] curved dorsad distally, apex brown and setose. Clasper basal segment wide, ventral margin concave, ventro-apical apex subacute to slightly rotundate; distal segment with ventral margin directed ventrad, truncate, entire mesal surface with dense acute spicules forming an efficient clasping structure.

Female.—General characteristics similar to male. Significant characters are the lateral aspect of segment 7 (Fig. 4d) and the dorsal aspect of tergum 10 (Fig. 4c).

Types.—Holotype male: California. Fresno County, Temperance Flat, 19 Aug. 1983, elevation 1000 ft, Donald J. Burdick. *Allotype:* Same data as holotype. *Paratypes:* Same data as holotype, 1 male; Kaiser Creek, below Round Mountain, 17 Aug. 1984, John F. MacDonald, 3 males, 1 female; Kaiser Wilderness, 23 July

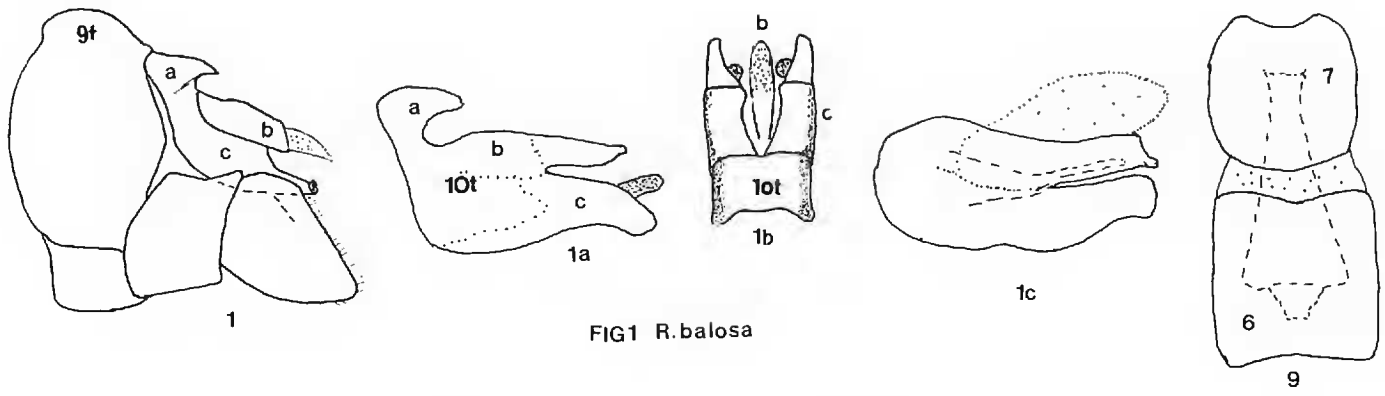


FIG1 R.balosa

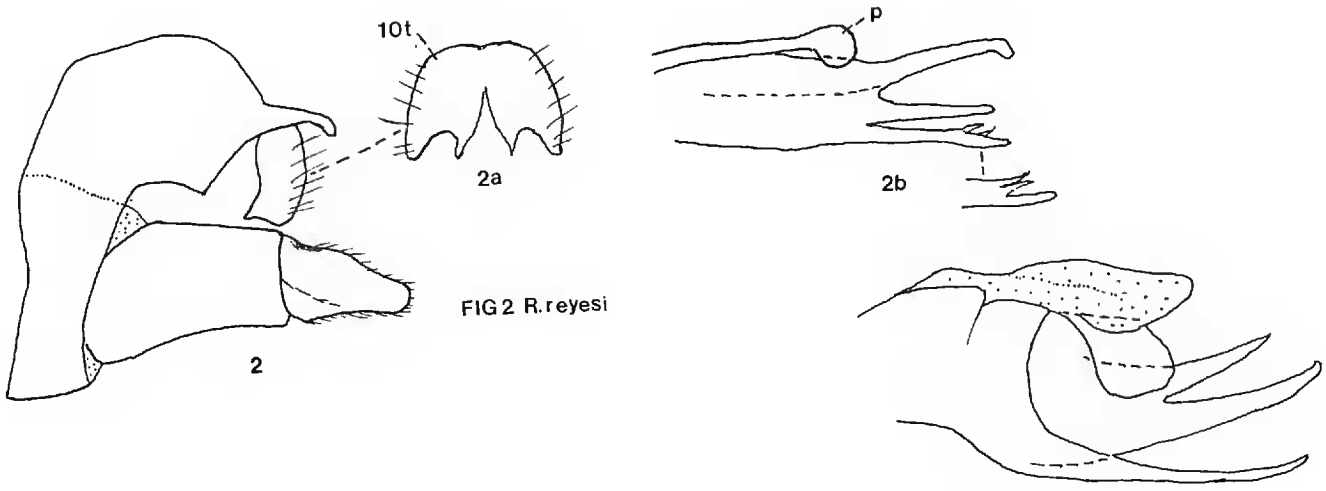
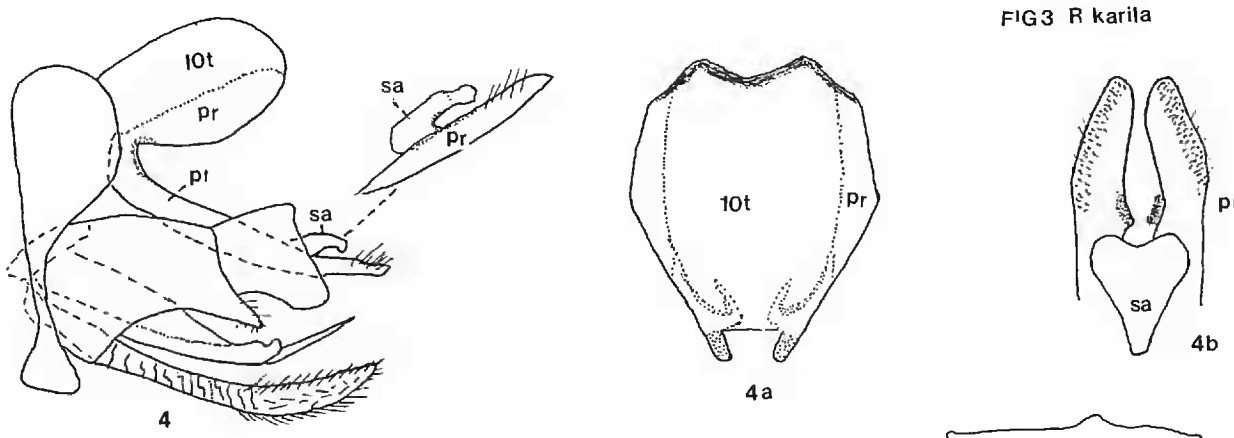


FIG2 R.reyesi

FIG3 R karila



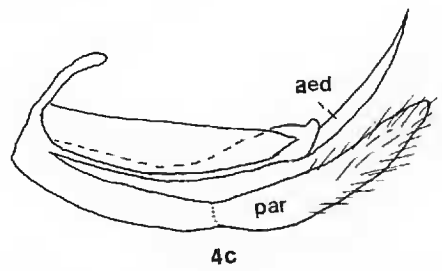


FIG4 R.chordata

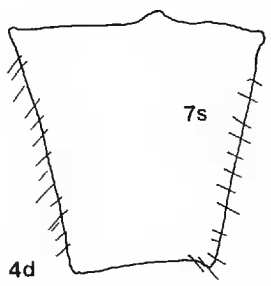


Illustration note: In all of the illustrations the following designations are used: terga 8, 9 and 10 (8t, 9t, and 10t); sclerite (sa); aedeagus (aed); paramere (par); preanal appendages (pr); clasper (cl); phallus complex (p).

Figures 1–4. 1. *Rhyacophia balosa* Denning, lateral aspect, male genitalia. a. Lateral view, tergum 10. b. Dorsal view, tergum 10. c. Lateral view, phallus complex. d. Female genitalia, bursa copulatrix, ventral view. 2. *Rhyacophila reyesi* Denning, male genitalia, lateral aspect. a. Caudal view, tergum 10. b. Phallus complex lateral view. 3. *Rhyacophila karila* Denning, lateral view, phallus complex. 4. *Rhyacophila chordata* Denning, lateral aspect showing anal sclerite (sa). a. Dorsal view, coalescence tergum 10 and preanals. b. Dorsal view, anal sclerite. c. Lateral view, parameres. d. Female genitalia, lateral view segment 7.

1984, about 9000 ft, John F. MacDonald, 1 male; Kings Canyon Road, 31 May 1963, 3500 ft, C. P. Alexander, 1 male; Billy Creek at Huntington Lake, 8–10 July 1985, Donald J. Burdick, 1 male; same, except 4–11 Sept. 1984, 1 male, 2 females; Sierra Summit, near China Peak, 10–17 July 1984, Donald J. Burdick, 2 males; same, except 14–22 Aug. 1984, 1 male. Toulume County, 21–25 June 1976, R. P. Allen, 1 male. Madera County, Casadel Woods, 12–15 Aug. 1983, 2 males; same, except 4–13 Sept. 1983, James Aotoki, 7 males; same, except 22–29 Aug. 1983, 1 male; same, except 13–20 Nov. 1983, 6 males; Lewis Creek Road 632, near Hwy. 41, 24 June–6 July 1983, Burke Zane, 2 males. Tulare County, Ash Mountain, Kaweah Power Station 3, 1 May 1986, Donald J. Burdick, 1 male; same, except 26 May 1984, 2 males; same, except 11 May 1985, 1 male, 1 female; Kaweah River near Lodge Pole, 28 June 1984, Richard F. Gill, 1 male; same, except 28 June–2 July 1984, 1 male; same, except 6–12 July 1984, 3 males; Johnsondale, South Creek, 17 July–4 Aug. 1985, Donald J. Burdick, 1 male, 2 females. Los Angeles County, San Gabrial Mts., 0.5 mi NE Camp Valcrest, 24 Apr. 1977, Charles L. Hogue, 1 male; same, except Alpine Canyon Creek, Hwy. 39, near Jct. North Fork San Gabrial River, 20 June 1977, Richard W. Baumann and Charles L. Hogue, 1 male; same, except Cold Brook, 1 male. Shasta County, McCumber Lake, 4 Nov. 1953, H. P. Chander, 1 male. Sierra County, North Yuba River, Hwy. 49, 17 Mar. 1972, D. S. Potter and R. A. Haick, 2 males. Nevada. White Pine County, Kalamazoo Creek, Schell Creek Range, 26 June 1977, A. L. Sheldon, 1 male. Clark County, Deer Creek, Spring Mountain, 21 Jan. 1984, Richard W. Baumann and Riley Nelson, 1 male. Arizona. Graham County, Wet Canyon Recreation Area, 5 June 1982, Richard W. Baumann and S. M. Clark, 1 male. Utah. Piute County, City Creek Campground, 27 Sept. 1981, Richard W. Baumann and S. M. Clark, 1 male. Summit County, Upper Provo River Falls, 9 Aug. 1978, Richard W. Baumann and John Unzicker, 1 male. Washington County, Zion National Park, Temple Sinawava, 30 Sept. 1981, Richard W. Baumann and S. M. Clark, 1 male. Utah County, stream near Mud Spring, Hwy. 80, 12 May 1982, Richard W. Baumann and I. R. Wais, 2 males, 2 females; same, except spring along North Fork American River, above Tiffle Reservoir, 12 May 1981, S. M. Clark, 1 male.

Four paratypes are in the private collections of D. J. Burdick, California State University, Fresno, California; 4 paratypes are in the private collection of Richard F. Gill, California State University, Fresno, California; 4 paratypes are in the collection of Richard W. Baumann, Brigham Young University, Monte L. Bean Life Science Museum, Provo, Utah.

It is interesting to note that specimens have been collected in almost every month of the year from elevations of about 1000 to 9000 feet. Collections were made from permanent streams and streams that become dry in July, August and September.

Dolophilodes columbia, New Species

This new species is a member of the *aequalis-pallidipes* group. It is closest to *aequalis* Banks. Differences from described species are: elongated apical segment of clasper, narrowed distal portion of basal segment of clasper and the small semicircular tergum 10 from dorsal view. Abdominal segments are black, heavily

pigmented and sclerotized. Forewing fork R/2+3 reaches beyond sa. Tergum 10 not visible from lateral view.

Male.—Length 10 mm. Wings fuscous, stigma prominent, antennae, head, thorax blackish; appendages fuscous, spurs 2-4-4, prominent and long. Genitalia (Fig. 5): Tergum 9 narrow, semi-circular, sternum projected caudad. Parameres [Fig. 5 (par)] small, curved ventral, apex rounded, setose. Clasper basal segment wide, narrowed distally, slightly longer than apical segment which is enlarged distally, apex rotundate. Tergum 9 (Fig. 5a, dorsal view) margins sinuous, narrow. Parameres originate at caudo-lateral angle, dorso-lateral margin of tergum 9 obliterates basal portion. Tergum 10 [Fig. 5a (10t)] inconspicuous, semi-circular, margin black pigmented, remainder opaque and semi-membraneous. Basal segment clasper from ventral aspect, somewhat shelf-like, semi-circular narrow band connection to sternum 9.

Types.—Holotype male: Washington. Columbia County, 35 mi S of Pomaray, Tucannon River, Umtilla National Forest, 6 June 1980, R. D. Akre. *Paratype male:* Same data as holotype. Holotype deposited in James Entomological Collection, Washington State University, Pullman, Washington. Paratype male to be deposited in the California Academy of Sciences.

In current keys this species will key out to *aequalis* (Banks).

Dolophilodes andora, New Species

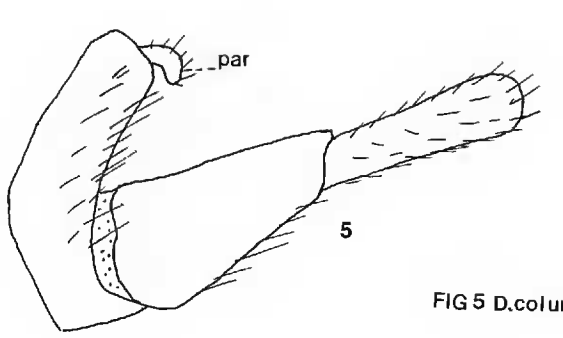
This is the tenth described species of the genus in North America north of Mexico. This species is related to *dorca* Ross, differing from that species as follows: Tergum 10 undivided, foliaceous processes of tergum 10 absent, contour of sternum 9 differs from *dorca,* and the claspers are distinctive.

Male.—Length 12 mm. Wings, appendages and body uniformly tan, stigma dark, spurs 1-4-4, prominent and darker than legs, inner spurs longer than outer. Fork R/2+3 of forewing extends beyond sa. A short mesal trianguloid structure present on sternum 8. Genitalia (Fig. 6): Segment 9, lateral aspect, narrow with dorsum somewhat triangular. Tergum 10 elongate, dorso-ventral margins parallel. Parameres almost as long as tergum 10, slender setose and directed dorsad. Clasper basal segment uniformly wide, baso-dorsal margin crescent 1c, distal segment enlarged, somewhat rounded; from ventral view mesal margin with dense row of brown, erect, acute spines. From dorsal aspect (Fig. 6a) tergum 9 abruptly narrowed to a thin strap; tergum 10 elongated, lateral margin dark pigmented, mesal area opaque, semi-membraneous, apices coalesced, rotundate. Paramere basal portion bears short mesal process and elongated lateral lobes with abundant short spicules (Fig. 6a; fig. is somewhat diagrammatic).

Types.—Holotype male: California. Trinity County, Swift Creek, 2.5 mi W of Forest Glen, Hwy. 36, 1 July 1977, Paul A. Peterson. *Paratype male:* Siskiyou County, Old Elma, 26 Sept. 1978, F. D. Horn, black light trap.

Wormaldia laona, New Species

The *Wormaldia thyria* group contains four species as follows: *thyria* Denning, 1950; *hamata* Denning, 1958; *quesugta* Schmid, 1968; and *loana* Denning, n. sp. *Wormaldia thyria* is recorded from Virginia and North Carolina. The three remaining species are known from several localities in California.



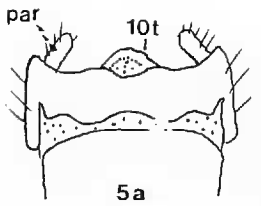
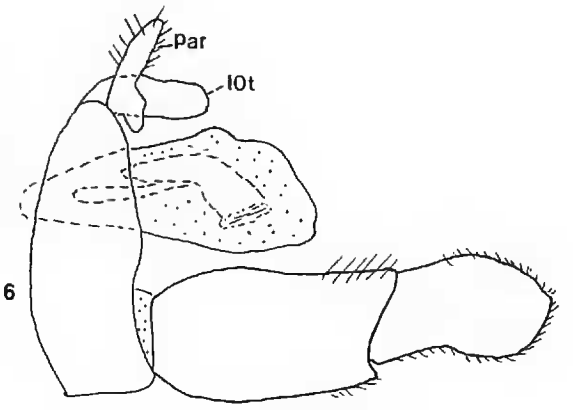
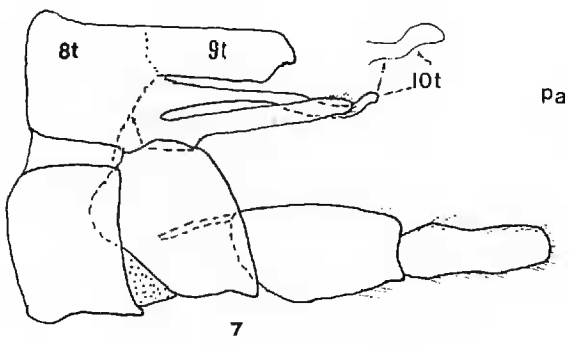
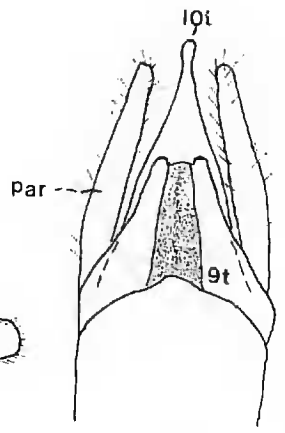


FIG 5 D.columbia







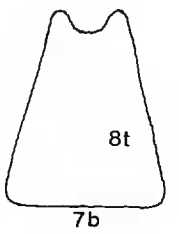


FIG 6 D.andora

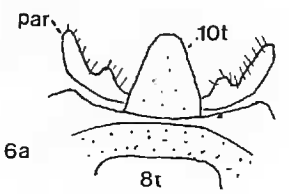
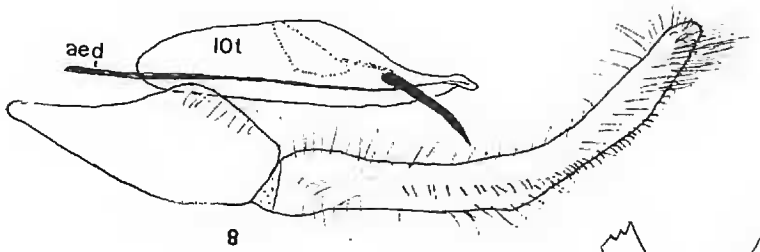


FIG 7 W.laona



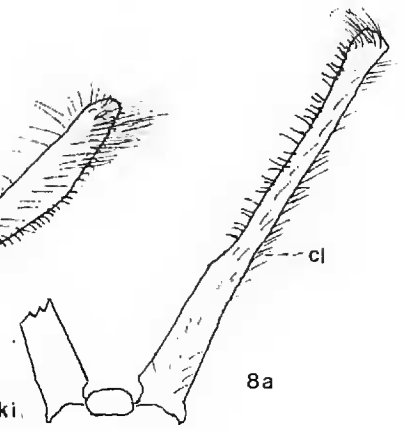
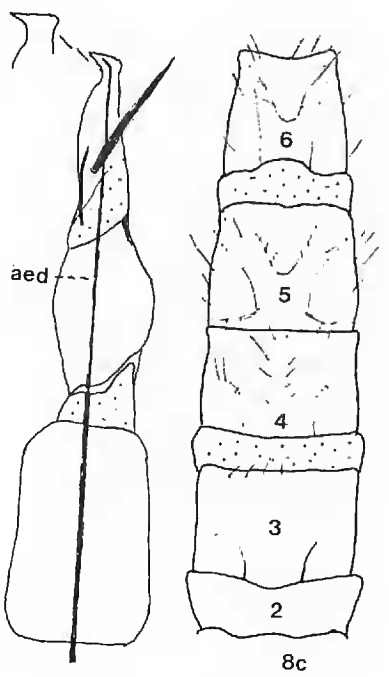
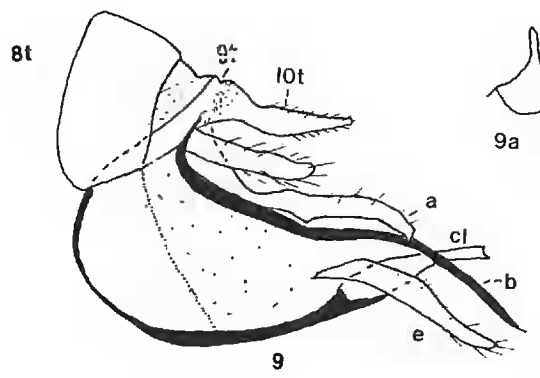
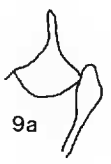


FIG 8 O.burdicki







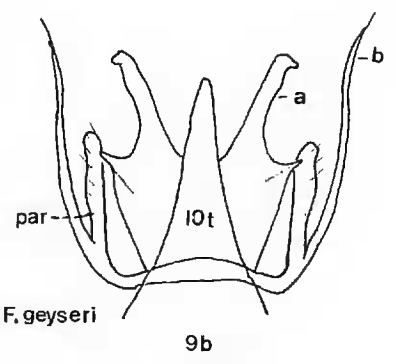
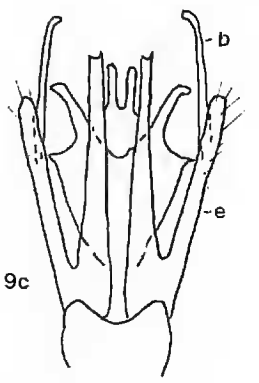


FIG 9 F.geyseri



Figures 5–9. 5. *Dolophilodes columbia* Denning, male genitalia, lateral aspect. a. Dorsal view, tergites 8, 9, and 10 and parameres. 6. *Dolophilodes andora* Denning, male genitalia, lateral aspect. a. Dorsal view, tergites 8, 9, and 10 and parameres. 7. *Wormaldia laona* Denning, male genitalia, lateral aspect. a. Dorsal view, tergites 8, 9, and 10 and parameres. b. Female genitalia, tergite 8, dorsal view. 8. *Ochrotrichia burdicki* Denning, male genitalia, segment 9, tergum 10 and claspers, lateral view. a. Claspers, ventral view. b. Tergum 10, dorsal view. c. Allotype female, segments 2–6, dorsal view. 9. *Farula geyseri* Denning, lateral aspect. a. Cervical sclerites. b. Tergum 10, dorsal view. c. Ventral view, sternum 9 and tergum 10.

Male.—Length 6–7 mm. General color wings and body fuscous, antennae and appendages ochraceous, wings with M/3+4 unbranched; hind wings with R/1 and R/2 separated almost to wing margin. Sternum 7 with a subtriangular meson structure. Foretibia outer spur expanded laterally. Genitalia (Fig. 7): Segment 8 tergum sclerotized and fuscous, fusion with tergum 9 obscure. Sternum 9, lateral view, caudal margin convex; tergum 9 elongate, dorsal and ventral margins parallel, directed caudad beyond sternum 9. Tergum 10 directed caudad beyond parameres, apex subacute and curved slightly dorsad, from dorsal view (Fig. 7a), the wide tergum may be slightly variable in width. Parameres long and slender, apex obtuse [Fig. 7, 7a (par)]. Clasper distal segment subequal to basal segment, margins parallel, apex rotundate, margins bear dense whitish setae. Tergum 9 (Fig. 7a, dorsal aspect) with wide shallow trough, entire length, dorso-lateral margins with rounded apex, shallow bifurcated apex. Tergum 10 directed slightly beyond parameres, narrowed distally, apex obicular.

Female.—Length 7 mm. General characteristics similar to male. Wings, body, appendages luteous. Sternites with no mesal structures. Distal margin of tergum 8 with shallow emargination (Fig. 7b).

Types.—*Holotype male:* California. Uvas Canyon Park, Swanson Creek, Santa Clara County, 2 June 1974, Donald G. Denning. *Allotype:* Same data as holotype. *Paratypes:* Same, except 15 June 1975, 1 male; same, except 3 Sept. 1973, 2 males, 1 female; same, except 7 Sept. 1975, 1 male. Monterey County, Julia Pfeiffer State Park, 25 July 1975, Donald G. Denning, 2 males; same, except 9 Sept. 1975, 1 male; creek, 6 mi S of Gorda, Hwy. 1, 23 June 1975, 1 male; same, except small creek, 24 mi SSE of Carmel, 12 July 1974, Paul A. Peterson, 1 male. San Luis Obispo County, Lopez Creek near Arroyo Grande, 13 Apr. 1965, P. R. Richardson, 1 male.

Ochrotrichia burdicki, New Species

The long slender claspers suggest this hydroptilid is related to *vertreesi* Denning and Blickle, although tergum 10 differs from that species in several details. The males are large and robust, the claspers are usually as long or longer than the abdomen—another characteristic of *vertreesi* males. The distinctive long curved claspers and the contour of terga 9 and 10 readily separate this from described *Ochrotrichia.*

Male.—Length 3–4.5 mm. Spurs 0-3-4; mesal spur of hind leg twice length of outer spur. General color various shades of brown, in alcohol. Genitalia (Fig. 8): Segment 9 (Fig. 8, lateral view) elongated apically, ventral margin curvate, dorsal margin trianguloid. Claspers long, slender, curved dorsad, setose, apex bearing tuft of dense black setae; from ventral view (Fig. 8a), prominent median fuscous pigmented semi-circular structure is present to which basal portion of claspers are attached; mesal margin bears about 45 acute black small spines which become dense and long at apex; claspers symmetrical. Tergum 10 (Fig. 8b, dorsal view) slightly asymmetrical, apex truncate bearing a minute acute projection mesally; a distinctive dark pigmented spine, long, slender, acute, directed latero-caudad and located subapically is present; apico-lateral area brown pigmented (shaded in Fig. 8b), a minute translucent tubular structure present along margin. The long, tubular aedeagus extends from segment 5 to near apex (aed) (Fig. 8b).

Allotype female.—General color and size similar to male. The paired apodemes extend from segment 5 to segment 11. The dorsal aspect of tergites 2 to 6 are shown in Figure 8c.

Types.—Holotype male: California. Fresno County, Dry Creek, 2 Sept. 1982, Richard F. Gill. *Allotype:* Same data as holotype. *Paratypes:* Same data as holotype, 7 males, 2 females; Dry Creek, 5 mi NE Academy, 14 May 1982, Richard F. Gill, 58 males; Little Dry Creek, Marshall Station, 19–26 Apr. 1982, Donald J. Burdick, light trap, 288 males, 88 females. This is a random sample taken from a jar containing several thousand specimens. Dry Creek and Little Dry Creek are intermittent creeks. The large number of specimens attest to an ideal aquatic environment for the larvae and adults. Literally thousands of specimens have been collected by Dr. Burdick and his students, most but not all, by black light trap. Thus only a small percentage of available specimens are listed as paratypes. Forty paratypes will be deposited in collections of Donald J. Burdick and Richard Gill, California State University, Fresno, California.

This species is named in honor of Donald J. Burdick, California State University, Fresno. Dr. Burdick and his students are making substantial research contributions to our knowledge of Trichoptera by their years of extensive collecting in unusual aquatic environments. "The black light trap which has collected many thousands of specimens was placed alongside the intermittent stream which in most years is dry by early July except for occasional small pools. The water usually returns to the stream in early October with the first rains," quote from Donald J. Burdick.

Farula geyseri, New Species

Over 50 years ago Dr. Lorus Milne described *Farula rainieri,* n. gen., n. sp. from a specimen collected at Mt. Rainier, Washington. To the present, 10 species of *Farula* are now named. All species are known only from Washington, Oregon and California. With only a few exceptions, specimens remain rare in collections. Aside from its small size this new species differs from described species in morphological details of tergum 9, tergum 10, parameres, claspers and other differences in the male genitalia.

In the interest of brevity and continuity, the original lettering of the male genitalia as employed in Ross' description of *malkini* is used with a few exceptions.

Male.—Length 4.5 mm. General characteristics similar to *petersoni* except small size. Mesothorax dorsum bimaculate with semi-circular non-pigmented areas occupying most of the dorsum. Antennae, legs ochraceous, spurs 1-2-4. Forewing venation dark, with R/1 and Cu fuscous and prominent; maxillary palpi porrect, the three segments equal in size; labial palpi 4 segmented, last segment 1.5 times longer than third which is slightly longer than second; cervical sclerites dark pigmented (Fig. 9a). Genitalia (Fig. 9): Tergum 9 consists of a membraneous area and a reduced sclerotized band [Fig. 9 (t)]. Tergum 10 dorsal branch slender, sinuate (Fig. 9); from dorsal view lateral margin dark and distinct (t), attenuated to subacute apex (Fig. 9b); from ventral view (Fig. 9c), ventral branch enlarged, deeply furcate with lateral projection short, acute, directed laterad, distal apices divergent, apex acute, dark pigmented, its probable function is to cover most of phallus and aedeagus. Parameres short, slender, apex orbicular, setation sparse

[Fig. 9 (par)]. Structure "b" long, tubular, apex acute (Fig. 9b); from ventral view apices curved mesad (Fig. 9c). Claspers directed caudad, narrowed distally to bifed apex; attachment is to heavily sclerotized sternum 9 ventral margin [Fig. 9, 9c (cl)]. Structure "e" (Fig. 9) fusiform, directed ventro-caudad, originates beyond dorsal margin of claspers; from ventral aspect (Fig. 9c) structure wide, distally more heavily setose than other structures, capable of dorso-ventral movement. Phallus bilobate, located between claspers which partially cover structure from dorsal view [Fig. 9b (p)].

Type.—Holotype male: California. Sonoma County, Big Sulfur Creek, about 7 mi W of Middletown, the Geysers, 22 Apr. 1986, Eric P. McElravy, pan trap.

The collector stated Big Sulfur Creek is intermittent, and usually dry in July, August and September.

Distribution of *Forula*

rainieri Milne, 1936, Washington, Oregon
malkini Ross, 1950, Oregon
davisi Denning, 1958, Oregon
jewetti Denning, 1968, Oregon
reapiri Schmid, 1968, Oregon
honeyi Denning, 1973, Southern California
petersoni Denning, 1983, Northern California
wigginsi Denning, 1983, Central California
praelonga Wiggins and Erman, 1987, Northern California
geyseri, n. sp., 1987, Northern California

Acknowledgments

The writer thanks the following entomologists for specimens used in this paper: Donald J. Burdick, Richard F. Gill, Paul A. Peterson, Richard W. Baumann, R. D. Akre, Vincent Resh and Eric P. McElravy.

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